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# Birds of the Reserva Biológica do Mato Grande and surroundings, Rio Grande do Sul, Brazil

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**Abstract:** The Reserva Biológica do Mato Grande encompasses 5,161 hectares of wetlands, *restinga* forests and grasslands in southern Brazil. Aiming to assemble a list of bird species occurring in the reserve, we carried out 21 monthly expeditions from July 2007 to March 2009 and an additional visit on October 2014, totaling 341 hours of sampling. We additionally searched for records in online databases and museums. In total, 211 species of birds were found, compared to 223.83 (SD = 3.88) and 214.68 (SD = 4.71) species respectively predicted through Jackknife 2 and Chao 2 estimations. *Plegadis chihi* was the most abundant bird roosting in the reserve. The area is important for the conservation of *Circus cinereus*, *Spartonoica maluroides*, *Limnortyx rectirostris* and *Sporophila palustris*, which are considered threatened or near-threatened in state, national and/or global levels. We emphasize the urgent need of implementing the Reserva Biológica do Mato Grande in order to conserve the regional avifauna.

**Key words:** wetlands, *restinga* forests, grasslands, conservation, protected areas

## INTRODUCTION

Wetlands exhibit high levels of primary productivity and are crucial for the maintenance of the life cycles of various aquatic and terrestrial organisms (EPA 2014). Apart the intrinsic importance for the maintenance of biodiversity, wetlands have considerable economic value in terms of ecosystem services such as fishery resources, usage as agricultural and recreational purposes, and flood mitigation, among others (Barbier et al. 1997). However, the maintenance of the functions

and services of wetlands depends on the integrity of ecological processes (e.g., decay of organic matter by microorganisms, exchange of matter and nutrients driven by migratory organisms such as fishes and birds associated with water movements) within these areas (Barbier et al. 1997; Keddy 2000). Wetlands have suffered high rates of habitat loss and degradation and are considered one of the most threatened ecosystems in the world (Maltby 1991). Major threats to wetlands include drainage, filling, conversion into urban and agricultural areas, pollution, and overexploitation of resources. These impacts modify wetland biodiversity (Weller 1999), resulting in the loss of the ecological processes that are important for the dynamics and stability of these ecosystems (Barbier et al. 1997; Keddy 2000).

The establishment of protected areas is one of the main strategies to prevent biodiversity loss in wetlands (Keddy 2000). However, to fulfill their conservation goals, protected areas must be properly implemented and have their biodiversity known (Furness and Greenwood 1993). Harboring 3,441 wetlands, the state of Rio Grande do Sul, in southern Brazil, is one of the regions with the largest number of these ecosystems in South America (Maltchik et al. 2003). These wetlands are potentially important for birds, not only because they provide foraging, roosting and breeding habitat for resident species, but also for their role as stopover sites or wintering areas for several migrants of both Nearctic and Neotropical origins (Belton 1994; Guadagnin et al. 2005; Bencke et al. 2007). However, bird inventories are available only for a few wetlands of Rio Grande do Sul (Mähler-Jr. et al. 1996; Accordi and Barcellos 2006; Accordi and Hartz 2006; Bencke et al. 2007; Harrison et al. 2013). Lack of adequate information on bird species

inhabiting wetlands greatly limits the development and establishment of efficient conservation strategies.

Located in the coastal region of southern Brazil, the Reserva Biológica do Mato Grande is a 5,161 ha protected area encompassing various wetland types, *restinga* forests and grasslands. Despite being situated in the Canal São Gonçalo “BirdLife International Important Bird Area” (Bencke et al. 2006), a region also highlighted as an “area of extreme importance for the conservation, sustainable use and benefit sharing of the Brazilian biodiversity” (MMA 2007), the avifauna of the reserve remains poorly known. The first ornithological study in the area was carried out by Emil Kaempfer, which collected birds around the village of Santa Isabel in 1931 (Naumburg 1935). Later, in the 1970s, William Belton observed, tape-recorded and collected birds in this same locality, as well as in farms that include portions of the reserve within their limits (Belton 1994). Despite being visited by two of the most active bird collectors in the ornithological history of Rio Grande do Sul, a list of birds recorded in the reserve and surrounding area does not exist.



**Figure 1.** Map showing the location of the Reserva Biológica do Mato Grande, state of Rio Grande do Sul, Brazil.



**Figure 2.** Limits (yellow) of the Reserva Biológica do Mato Grande, Brazil. The white lines indicate bird sampling transects in the eastern (right) and western (left) sectors of the reserve. Source: Google Earth™.

Here, we aimed to list bird species occurring in the Reserva Biológica do Mato Grande and surroundings. We surveyed birds in the field and searched for additional records in museums and virtual repositories of voice recordings and photographs. We followed guidelines to adequately list and document species in avian inventories (Bencke et al. 2010; Lees et al. 2014). We also provide data of abundance for species of conservation concern and for species congregating in roosts within the reserve. Based on our findings, we discuss the importance of this protected area for the conservation of endangered, endemic and/or wetland birds in the region.

## MATERIALS AND METHODS

### Study area

The Reserva Biológica do Mato Grande (RBMG) (32°08' S, 52°40' W) is a state-administrated biological reserve located in Arroio Grande municipality, southern Rio Grande do Sul, Brazil (Figure 1). The boundaries of the reserve are the Lagoa Mirim to the south, the Canal São Gonçalo to the east, the Arroio Parapó to the west, and grasslands and rice paddies situated on higher ground to the north (Figure 2). The decree establishing this protected area dates from 1975 (State Decree 23.798/75). Although a manager has been recently designated, full implementation of the reserve, including land use and tenure, remains pending.

Vegetation in the RBMG is composed largely by pioneer species established in geologically recent areas such as the Coastal Plain of Rio Grande do Sul (IBGE 1986) (Figure 3). Most of the reserve is comprised by freshwater marshes dominated by various species of emergent (*Scirpus* spp., *Schoenoplectus californicus* (C.A. Mey.) Palla., *Zizaniopsis* sp.) and floating (*Pistia*, *Nymphoides*, *Eichornia*, *Salvinia*) aquatic macrophytes. *Sarandi* (*Phyllanthus sellowianus* (Klotzsch) Müll.Arg., *Sebastiania schottiana* (Müll. Arg.)) bushes are also common. Seasonally flooded grasslands are found marginally to the marshes. Stands of *Panicum prionitis* Nees and *Eryngium pandanifolium* Cham. & Schltdl occur in these areas. Comparatively higher grounds within the reserve are covered with sandy grasslands and *restinga* forests. The arborescent stratum of the latter is comprised mostly by *Erythrina crista-galli* L., *Ficus* spp, and *Syagrus romanzoffiana* (Cham.) Glassman, while the lower stratum is dominated by the shrubby *Psychotria* spp., *Justicia brasiliana* Roth and *Calliandra tweedii* Benth. Patches of *Bromelia antiacantha* Bertol. are also common in forest edges. Short segments (up to 1 km) of sandy or muddy beaches are found along the margins of the Lagoa Mirim. Cattle roam free inside the reserve and illegal hunting, fishing and occasional bird trapping also occur. Areas adjacent to the reserve are used for irrigated rice cultivation. Small patches of eucalyptus and *restinga* forests are found in these areas, as well as a



few grassland and wetland remnants.

Climate in the region is sub-humid (IBGE 1986). In the neighboring municipality of Capão do Leão, mean annual temperature is 17.8°C, mean annual rainfall is 1.366 mm and mean relative humidity is 80.7% (Estação Agroclimatológica de Pelotas 2014). The annual water balance in the region is as follows: deficit from December to March, reposition in April and May, surplus from June to September, and withdrawal in October and November (Klein 1998). Water level in wetlands is consequently lower in late summer and early autumn and higher in the winter and early spring.

### Data acquisition and analysis

Between July 2007 and March 2009 we carried out 21 monthly expeditions to the study area. An additional expedition was carried out on 23 October 2014. Expeditions lasted 1–2 days each (10–34 h of sampling effort), totaling 341 hours of fieldwork. We surveyed two sectors of the RBMG (Figure 2). The western part of the reserve was visited on 13 occasions. We searched for birds mainly along an 8.5 km transect, from rice lands bordering the reserve to the *restinga* forest and sandy/muddy beaches of the Lagoa Mirim. The eastern part of the reserve was visited nine times. We surveyed birds mostly along a



**Figure 3.** Major habitat features of the Reserva Biológica do Mato Grande, Brazil. (a) Open grassy marsh at the transition with sandy grassland over ancient beach ridge. (b) *Sarandi* bushes and tall emergent herbaceous plants such as *Zizaniopsis* sp. (right) cover most of the central sector of the reserve. (c) Stands of *Schoenoplectus californicus* are also common in marshes. (d) *Panicum prionitis* tussocks and the spiny *Eryngium pandanifolium* dominate the upper stratum of seasonally flooded grasslands along the Canal São Gonçalo. (e) An *E. pandanifolium* (left) patch marking the transition between wetlands and dryer grasslands in higher ground (right) along the northeastern limit of the reserve. (f) Floating aquatic macrophytes in open marsh with *restinga* forest over beach ridge in the background; large trees are *Ficus* sp. and *Erythrina crista-galli*. (g) *Syagrus romanzoffiana* palms in *restinga* forest over sandy beach ridge. (h) Muddy and sandy beaches with small *sarandi* bushes along the Lagoa Mirim. Photographs by RAD, except (c) by JVB.

6 km transect, from rice growing areas adjacent to the reserve to flooded grasslands and the sandy beach at the Lagoa Mirim. Vegetation in both sectors was overall similar, with a slight predominance of open marsh with floating macrophytes in the west, and seasonally flooded grasslands with *P. prionitis* and *E. pandanifolium* in the east. We ensured that bird surveys covered annual seasons equally in both sectors.

Birds were detected and identified visually with the aid of binoculars and by recording and comparing vocalizations. We played-back voice recordings of secretive species such as marsh-dwelling rails and furnariids to ensure detection. Species detected near the RBMG (up to 5 km from the limits of the reserve) were included in the list. For species of conservation importance, we also recorded the number of individuals detected each time the species was found. We further counted roosting birds within the reserve. Counts were made from prominent points where individuals flying into the roosting areas could be visualized. Records were documented with photographs (deposited at [www.wikiaves.com](http://www.wikiaves.com)) and/or digital recordings of their voices (deposited at [www.xeno-canto.org](http://www.xeno-canto.org)). Documented records can be accessed online using the voucher numbers listed in Table 1. We also searched for specimens from the RBMG and vicinities deposited in ornithological collections. We visited the Museu de Ciências Naturais (MCN) of the Fundação Zoobotânica do Rio Grande do Sul, and the Museu de Ciências e Tecnologia (MCT) of the Pontifícia Universidade Católica do Rio Grande do Sul, both located in Porto Alegre, RS, Brazil. We also searched the ORNIS digital database (<http://www.ornisnet.org>) for specimens housed in North American collections and recordings deposited in the Macaulay Library (<http://macaulaylibrary.org>). We only listed specimens whose collection locality could be safely attributed to the RBMG, either by a direct reference to the area in the label or by plotting the geographic coordinates available on the label on a map.

Scientific nomenclature and species sequence follows CBRO (2014). Because the RBMG lies within the area of overlap of the ranges of *Craniroleuca obsoleta* (Reichenbach, 1853) and *Craniroleuca pyrrhophia* (Vieillot, 1818) and that hybridization is expected to occur (Belton 1994; Claramunt 2002), we treated all individuals of this genus recorded in arboreal formations of the reserve as *Craniroleuca* sp. We listed species considered endemic of the Pampas and Atlantic Forest biogeographic provinces according to Bencke et al. (2006). Threat status in state, national and global levels follows Rio Grande do Sul (2014), MMA (2014) and IUCN (2014), respectively. We provided detailed information of our records for species of conservation concern and/or birds with poorly known distributions in Rio Grande do Sul. We considered the record of a given species for the RBMG a distributional

novelty within Rio Grande do Sul when the nearest state record provided in Belton (1994), Mähler-Jr. et al. (1996), Dias and Maurício (1998), Maurício and Dias (1996, 2000) and Bencke et al. (2003) lies over 100 km from the limits of the reserve. We also considered distributional novelties species known from less than five localities in southern Rio Grande do Sul (i.e., south of 31° S) according to these same sources.

In order to assess sampling completeness, we used the second-order Jackknife and Chao species richness estimators (Gotelli and Colwell 2010). We chose these estimators because our data was incidence-based and because they outperform other estimators in terms of error and accuracy (Gotelli and Colwell 2010). We considered each visit to the area as a sampling unit and used the incidence of each species in our full sample of 22 visits to estimate richness. We ran analyses in EstimateS 9.1.0 (Colwell 2013).

## RESULTS

### Species richness

We listed 211 species of birds for the RBMG region, 205 of which were recorded by us in the field within the limits of the reserve (Table 1). We detected *Rhea americana* (Linnaeus, 1758), *Porphyrio martinicus* (Linnaeus, 1766), *Anthus furcatus* d'Orbigny & Lafresnaye, 1837 and *Sporophila ruficollis* Cabanis, 1851 solely in the vicinities of the reserve. *Fulica armillata* Vieillot, 1817 and *Asio clamator* (Vieillot, 1808) were not detected by us in the field, but were included based on specimens collected in the vicinities of the reserve. We provided documentation for 186 species, including voice recordings and specimens collected by William Belton in the 1970s and specimens collected by Emil Kaempfer in 1931 (Table 1).

Species richness was estimated at 223.83 (SD = 3.88) and 214.68 (SD = 4.71) species using the Jackknife 2 and Chao 2 estimators, respectively. Thus, observed richness corresponds to 93.82% and 97.82% of the estimated richness.

### Distributional novelties

Records of the following species constitute distributional novelties within Rio Grande do Sul: *Sarkidiornis sylvicola* Ihering & Ihering, 1907, *Tigrisoma lineatum* (Boddaert, 1783), *Laterallus melanophaius* (Vieillot, 1819), *Pardirallus maculatus* (Boddaert, 1783), *Chroicocephalus cirrocephalus* (Vieillot, 1818), *Micrococyx cinereus* (Vieillot, 1817), *Bubo virginianus* (Gmelin, 1788), *Melanerpes candidus* (Otto, 1796), *Euscarthmus meloryphus* Wied, 1831, *Elaenia flavogaster* (Thunberg, 1822), *Icterus pyrrhopterus* (Vieillot, 1819), *Saltator similis* d'Orbigny & Lafresnaye, 1837, *S. ruficollis*, *Sporophila cinnamomea* (Lafresnaye, 1839), and *Euphonia chlorotica* (Linnaeus, 1766). Records of poorly known species in Rio Grande do Sul are detailed below, with the exception of *S. ruficollis*

**Table 1.** List of bird species recorded in the Reserva Biológica do Mato Grande, state of Rio Grande do Sul, southern Brazil, with conservation status, endemism and voucher details. Conservation status in state (RS, *sensu* Rio Grande do Sul 2014), national (Br, *sensu* MMA 2014) and global (Gl, *sensu* IUCN 2014) levels: EN – Endangered, VU – Vulnerable, and NT – Near-threatened. Endemism (*sensu* Bencke et al. 2006): Pampas – Pa, and Atlantic Forest – AF. Museum acronyms: AMNH – American Museum of Natural History, New York, USA, MCN – Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Brazil.

	Status	Photo	Voice	Specimen
<b>RHEIFORMES</b> Forbes, 1884				
<b>Rheidae</b> Bonaparte, 1849				
<i>Rhea americana</i> (Linnaeus, 1758)	NT (Gl)			AMNH321725
<b>TINAMIFORMES</b> Huxley, 1872				
<b>Tinamidae</b> Gray, 1840				
<i>Nothura maculosa</i> (Temminck, 1815)		<a href="https://www.wikiaves.com/1497830">wikiaves.com/1497830</a>		
<b>ANSERIFORMES</b> Linnaeus, 1758				
<b>Anhimidae</b> Stejneger, 1885				
<i>Chauna torquata</i> (Oken, 1816)		<a href="https://www.wikiaves.com/1502834">wikiaves.com/1502834</a>	<a href="https://macaulaylibrary.org/audio/18847">macaulaylibrary.org/audio/18847</a>	AMNH321726
<b>Anatidae</b> Leach, 1820				
<i>Dendrocygna bicolor</i> (Vieillot, 1816)		<a href="https://www.wikiaves.com/1115552">wikiaves.com/1115552</a>		
<i>Dendrocygna viduata</i> (Linnaeus, 1766)		<a href="https://www.wikiaves.com/1503468">wikiaves.com/1503468</a>		
<i>Cygnus melancoryphus</i> (Molina, 1782)		<a href="https://www.wikiaves.com/1500346">wikiaves.com/1500346</a>		
<i>Coscoroba coscoroba</i> (Molina, 1782)		<a href="https://www.wikiaves.com/1118366">wikiaves.com/1118366</a>		
<i>Sarkidiornis sylvicola</i> Ihering & Ihering, 1907		<a href="https://www.wikiaves.com/1150786">wikiaves.com/1150786</a>		
<i>Callonetta leucophrys</i> (Vieillot, 1816)		<a href="https://www.wikiaves.com/1138368">wikiaves.com/1138368</a>		
<i>Amazonetta brasiliensis</i> (Gmelin, 1789)		<a href="https://www.wikiaves.com/1135087">wikiaves.com/1135087</a>		
<i>Anas flavirostris</i> Vieillot, 1816			<a href="https://xeno-canto.org/22557">xeno-canto.org/22557</a>	
<i>Anas georgica</i> Gmelin, 1789			<a href="https://xeno-canto.org/20597">xeno-canto.org/20597</a>	
<i>Anas versicolor</i> Vieillot, 1816		<a href="https://www.wikiaves.com/1496641">wikiaves.com/1496641</a>		
<i>Netta peposaca</i> (Vieillot, 1816)			<a href="https://xeno-canto.org/23277">xeno-canto.org/23277</a>	
<b>PODICIPEDIFORMES</b> Fürbringer, 1888				
<b>Podicipedidae</b> Bonaparte, 1831				
<i>Rollandia rolland</i> (Quoy & Gaimard, 1824)		<a href="https://www.wikiaves.com/1019623">wikiaves.com/1019623</a>		
<i>Podilymbus podiceps</i> (Linnaeus, 1758)		<a href="https://www.wikiaves.com/1118758">wikiaves.com/1118758</a>		
<i>Podiceps major</i> (Boddaert, 1783)		<a href="https://www.wikiaves.com/1503473">wikiaves.com/1503473</a>		
<b>PHOENICOPTERIFORMES</b> Fürbringer, 1888				
<b>Phoenicopteridae</b> Bonaparte, 1831				
<i>Phoenicopeterus chilensis</i> Molina, 1782	NT (Gl)	<a href="https://www.wikiaves.com/1147599">wikiaves.com/1147599</a>		
<b>CICONIIFORMES</b> Bonaparte, 1854				
<b>Ciconiidae</b> Sundevall, 1836				
<i>Ciconia maguari</i> (Gmelin, 1789)		<a href="https://www.wikiaves.com/1139326">wikiaves.com/1139326</a>		
<i>Mycteria americana</i> Linnaeus, 1758		<a href="https://www.wikiaves.com/1115548">wikiaves.com/1115548</a>		
<b>SULIFORMES</b> Sharpe, 1891				
<b>Phalacrocoracidae</b> Reichenbach, 1849				
<i>Phalacrocorax brasilianus</i> (Gmelin, 1789)		<a href="https://www.wikiaves.com/1509170">wikiaves.com/1509170</a>		AMNH321801
<b>PELECANIFORMES</b> Sharpe, 1891				
<b>Ardeidae</b> Leach, 1820				
<i>Tigrisoma lineatum</i> (Boddaert, 1783)				
<i>Botaurus pinnatus</i> (Wagler, 1829)				
<i>Nycticorax nycticorax</i> (Linnaeus, 1758)		<a href="https://www.wikiaves.com/1497891">wikiaves.com/1497891</a>		
<i>Butorides striata</i> (Linnaeus, 1758)		<a href="https://www.wikiaves.com/1137437">wikiaves.com/1137437</a>		AMNH321789; AMNH321790; AMNH321791
<i>Bubulcus ibis</i> (Linnaeus, 1758)		<a href="https://www.wikiaves.com/1137436">wikiaves.com/1137436</a>		
<i>Ardea cocoi</i> Linnaeus, 1766		<a href="https://www.wikiaves.com/1137433">wikiaves.com/1137433</a>		
<i>Ardea alba</i> Linnaeus, 1758		<a href="https://www.wikiaves.com/1136405">wikiaves.com/1136405</a>		
<i>Syrigma sibilatrix</i> (Temminck, 1824)		<a href="https://www.wikiaves.com/1497926">wikiaves.com/1497926</a>		
<i>Egretta thula</i> (Molina, 1782)		<a href="https://www.wikiaves.com/1506344">wikiaves.com/1506344</a>		
<b>Threskiornithidae</b> Poche, 1904				
<i>Plegadis chihi</i> (Vieillot, 1817)		<a href="https://www.wikiaves.com/1115555">wikiaves.com/1115555</a>		MCN366; MCN369
<i>Phimosus infuscatus</i> (Lichtenstein, 1823)		<a href="https://www.wikiaves.com/1147598">wikiaves.com/1147598</a>		AMNH321775; AMNH321776; AMNH321777; AMNH321778; AMNH321779
<i>Theristicus caerulescens</i> (Vieillot, 1817)		<a href="https://www.wikiaves.com/1153857">wikiaves.com/1153857</a>		
<i>Platalea ajaja</i> Linnaeus, 1758		<a href="https://www.wikiaves.com/1502828">wikiaves.com/1502828</a>		
<b>CATHARTIFORMES</b> Seebohm, 1890				
<b>Cathartidae</b> Lafresnaye, 1839				
<i>Cathartes aura</i> (Linnaeus, 1758)				
<i>Cathartes burrovianus</i> Cassin, 1845		<a href="https://www.wikiaves.com/1114183">wikiaves.com/1114183</a>		

Continued



Table 1. Continued.

	Status	Photo	Voice	Specimen
<b>ACCIPITRIFORMES</b> Bonaparte, 1831				
<b>Accipitridae</b> Vigors, 1824				
<i>Circus cinereus</i> Vieillot, 1816	VU (Br, RS)	<a href="https://wikiaves.com/1181956">wikiaves.com/1181956</a> ; <a href="https://wikiaves.com/1503464">wikiaves.com/1503464</a>		
<i>Circus buffoni</i> (Gmelin, 1788)		<a href="https://wikiaves.com/1506345">wikiaves.com/1506345</a>		
<i>Rostrhamus sociabilis</i> (Vieillot, 1817)		<a href="https://wikiaves.com/1147602">wikiaves.com/1147602</a>		
<i>Heterospizias meridionalis</i> (Latham, 1790)		<a href="https://wikiaves.com/1141185">wikiaves.com/1141185</a>		
<i>Urubitinga urubitinga</i> (Gmelin, 1788)		<a href="https://wikiaves.com/733901">wikiaves.com/733901</a>		
<i>Rupornis magnirostris</i> (Gmelin, 1788)		<a href="https://wikiaves.com/1496628">wikiaves.com/1496628</a>		
<b>GRUIFORMES</b> Bonaparte, 1854				
<b>Aramidae</b> Bonaparte, 1852				
<i>Aramus guarauna</i> (Linnaeus, 1766)		<a href="https://wikiaves.com/1136404">wikiaves.com/1136404</a>		MCN676; AMNH321774; AMNH321774
<b>Rallidae</b> Rafinesque, 1815				
<i>Aramides ypecaha</i> (Vieillot, 1819)		<a href="https://wikiaves.com/1509174">wikiaves.com/1509174</a>		
<i>Laterallus melanophaius</i> (Vieillot, 1819)			<a href="https://xeno-canto.org/23276">xeno-canto.org/23276</a>	
<i>Pardirallus maculatus</i> (Boddaert, 1783)		<a href="https://wikiaves.com/1496634">wikiaves.com/1496634</a>		
<i>Pardirallus sanguinolentus</i> (Swainson, 1837)			<a href="https://xeno-canto.org/21154">xeno-canto.org/21154</a>	
<i>Gallinula galeata</i> (Lichtenstein, 1818)		<a href="https://wikiaves.com/1299241">wikiaves.com/1299241</a>	<a href="https://xeno-canto.org/22561">xeno-canto.org/22561</a>	MCN361
<i>Gallinula melanops</i> (Vieillot, 1819)				
<i>Porphyrio martinicus</i> (Linnaeus, 1766)		<a href="https://wikiaves.com/1491719">wikiaves.com/1491719</a>		
<i>Fulica armillata</i> Vieillot, 1817				MCN694
<i>Fulica ruffrons</i> Philippi & Landbeck, 1861		<a href="https://wikiaves.com/1120863">wikiaves.com/1120863</a>		
<i>Fulica leucoptera</i> Vieillot, 1817		<a href="https://wikiaves.com/1134977">wikiaves.com/1134977</a>		MCN697
<b>CHARADRIIFORMES</b> Huxley, 1867				
<b>Charadriidae</b> Leach, 1820				
<i>Vanellus chilensis</i> (Molina, 1782)		<a href="https://wikiaves.com/1161338">wikiaves.com/1161338</a>		AMNH321750
<i>Pluvialis dominica</i> (Statius Muller, 1776)		<a href="https://wikiaves.com/1149198">wikiaves.com/1149198</a>		
<i>Charadrius semipalmatus</i> Bonaparte, 1825				
<i>Charadrius collaris</i> Vieillot, 1818		<a href="https://wikiaves.com/1113937">wikiaves.com/1113937</a>		
<i>Charadrius modestus</i> Lichtenstein, 1823				
<b>Haematopodidae</b> Bonaparte, 1838				
<i>Haematopus palliatus</i> Temminck, 1820				
<b>Recurvirostridae</b> Bonaparte, 1831				
<i>Himantopus melanurus</i> Vieillot, 1817		<a href="https://wikiaves.com/1120882">wikiaves.com/1120882</a>	<a href="https://macaulaylibrary.org/audio/18876">macaulaylibrary.org/audio/18876</a>	
<b>Scolopacidae</b> Rafinesque, 1815				
<i>Gallinago paraguaiiae</i> (Vieillot, 1816)		<a href="https://wikiaves.com/1181955">wikiaves.com/1181955</a>		
<i>Tringa solitaria</i> Wilson, 1813		<a href="https://wikiaves.com/1491717">wikiaves.com/1491717</a>		MCN720
<i>Tringa melanoleuca</i> (Gmelin, 1789)		<a href="https://wikiaves.com/1153859">wikiaves.com/1153859</a>	<a href="https://xeno-canto.org/21152">xeno-canto.org/21152</a>	
<i>Tringa flavipes</i> (Gmelin, 1789)			<a href="https://xeno-canto.org/200410">xeno-canto.org/200410</a> ; <a href="https://macaulaylibrary.org/audio/18877">macaulaylibrary.org/audio/18877</a>	AMNH321752; AMNH321753
<i>Calidris fuscicollis</i> (Vieillot, 1819)		<a href="https://wikiaves.com/1118362">wikiaves.com/1118362</a>	<a href="https://xeno-canto.org/20607">xeno-canto.org/20607</a>	
<i>Calidris melanotos</i> (Vieillot, 1819)		<a href="https://wikiaves.com/1138367">wikiaves.com/1138367</a> ; <a href="https://wikiaves.com/1503499">wikiaves.com/1503499</a>	<a href="https://macaulaylibrary.org/audio/18878">macaulaylibrary.org/audio/18878</a>	AMNH321759; AMNH321760; AMNH321761; AMNH321762; AMNH321763
<i>Calidris subruficollis</i> (Vieillot, 1819)	NT (Gl), VU (Br)	<a href="https://wikiaves.com/1644460">wikiaves.com/1644460</a>		
<b>Jacanidae</b> Chenu & Des Murs, 1854				
<i>Jacana jacana</i> (Linnaeus, 1766)		<a href="https://wikiaves.com/1141183">wikiaves.com/1141183</a>		AMNH321773
<b>Laridae</b> Rafinesque, 1815				
<i>Chroicocephalus maculipennis</i> (Lichtenstein, 1823)		<a href="https://wikiaves.com/1122474">wikiaves.com/1122474</a>	<a href="https://xeno-canto.org/22562">xeno-canto.org/22562</a>	
<i>Chroicocephalus cirrocephalus</i> (Vieillot, 1818)				
<i>Larus dominicanus</i> Lichtenstein, 1823		<a href="https://wikiaves.com/1142906">wikiaves.com/1142906</a>		
<b>Sternidae</b> Vigors, 1825				
<i>Sternula superciliaris</i> (Vieillot, 1819)		<a href="https://wikiaves.com/1115550">wikiaves.com/1115550</a>		AMNH321745; AMNH321746; AMNH321747; AMNH321748; AMNH321749
<i>Phaetusa simplex</i> (Gmelin, 1789)		<a href="https://wikiaves.com/1115553">wikiaves.com/1115553</a>		
<i>Gelochelidon nilotica</i> (Gmelin, 1789)				
<i>Sterna trudeaui</i> Audubon, 1838			<a href="https://xeno-canto.org/22563">xeno-canto.org/22563</a>	
<b>Rynchopidae</b> Bonaparte, 1838				
<i>Rynchops niger</i> Linnaeus, 1758				
<b>Columbiformes</b> Latham, 1790				
<b>Columbidae</b> Leach, 1820				
<i>Columbina talpacoti</i> (Temminck, 1811)		<a href="https://wikiaves.com/1503483">wikiaves.com/1503483</a>		
<i>Columbina picui</i> (Temminck, 1813)		<a href="https://wikiaves.com/1115549">wikiaves.com/1115549</a>		
<i>Pataqioenas picazuro</i> (Temminck, 1813)			<a href="https://xeno-canto.org/21640">xeno-canto.org/21640</a>	

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Table 1. Continued.

	Status	Photo	Voice	Specimen
<i>Zenaida auriculata</i> (Des Murs, 1847)		<a href="https://www.wikiaves.com/1161340">wikiaves.com/1161340</a>		
<i>Leptotila verreauxi</i> Bonaparte, 1855		<a href="https://www.wikiaves.com/1508310">wikiaves.com/1508310</a>	<a href="https://xeno-canto.org/200395">xeno-canto.org/200395</a>	
<b>CUCULIFORMES</b> Wagler, 1830				
<b>Cuculidae</b> Leach, 1820				
<i>Micrococcyx cinereus</i> (Vieillot, 1817)			<a href="https://xeno-canto.org/29035">xeno-canto.org/29035</a>	
<i>Piaya cayana</i> (Linnaeus, 1766)				
<i>Coccyzus melacoryphus</i> Vieillot, 1817		<a href="https://www.wikiaves.com/1139328">wikiaves.com/1139328</a>	<a href="https://macaulaylibrary.org/audio/19005">macaulaylibrary.org/audio/19005</a>	
<i>Crotophaga ani</i> Linnaeus, 1758		<a href="https://www.wikiaves.com/1500347">wikiaves.com/1500347</a>		
<i>Guira guira</i> (Gmelin, 1788)		<a href="https://www.wikiaves.com/1141184">wikiaves.com/1141184</a>		MCN835
<b>STRIGIFORMES</b> Wagler, 1830				
<b>Tytonidae</b> Mathews, 1912				
<i>Tyto furcata</i> (Temminck, 1827)				
<b>Strigidae</b> Leach, 1820				
<i>Megascops choliba</i> (Vieillot, 1817)			<a href="https://xeno-canto.org/22565">xeno-canto.org/22565</a>	MCN806
<i>Bubo virginianus</i> (Gmelin, 1788)			<a href="https://xeno-canto.org/23275">xeno-canto.org/23275</a>	
<i>Athene cunicularia</i> (Molina, 1782)		<a href="https://www.wikiaves.com/1137434">wikiaves.com/1137434</a>		
<i>Asio clamator</i> (Vieillot, 1808)			<a href="https://macaulaylibrary.org/audio/19012">macaulaylibrary.org/audio/19012</a>	MCN817
<b>CAPRIMULGIFORMES</b> Ridgway, 1881				
<b>Caprimulgidae</b> Vigors, 1825				
<i>Hydropsalis torquata</i> (Gmelin, 1789)		<a href="https://www.wikiaves.com/1141181">wikiaves.com/1141181</a>		
<i>Chordeiles nacunda</i> (Vieillot, 1817)				
<i>Chordeiles minor</i> (Forster, 1771)				
<b>APODIFORMES</b> Peters, 1940				
<b>Trochilidae</b> Vigors, 1825				
<i>Chlorostilbon lucidus</i> (Shaw, 1812)		<a href="https://www.wikiaves.com/1138371">wikiaves.com/1138371</a>		
<i>Hylocharis chrysura</i> (Shaw, 1812)		<a href="https://www.wikiaves.com/1141182">wikiaves.com/1141182</a>		
<b>CORACIIFORMES</b> Forbes, 1844				
<b>Alcedinidae</b> Rafinesque, 1815				
<i>Megaceryle torquata</i> (Linnaeus, 1766)		<a href="https://www.wikiaves.com/1497824">wikiaves.com/1497824</a>		
<i>Chloroceryle amazona</i> (Latham, 1790)		<a href="https://www.wikiaves.com/1118761">wikiaves.com/1118761</a>		
<i>Chloroceryle americana</i> (Gmelin, 1788)		<a href="https://www.wikiaves.com/1505170">wikiaves.com/1505170</a>		AMNH321814; AMNH321816
<b>PICIFORMES</b> Meyer & Wolf, 1810				
<b>Picidae</b> Leach, 1820				
<i>Melanerpes candidus</i> (Otto, 1796)				
<i>Veniliornis spilogaster</i> (Wagler, 1827)	AF			
<i>Colaptes melanochloros</i> (Gmelin, 1788)		<a href="https://www.wikiaves.com/1139330">wikiaves.com/1139330</a>		AMNH822191
<i>Colaptes campestris</i> (Vieillot, 1818)		<a href="https://www.wikiaves.com/1139329">wikiaves.com/1139329</a>		
<b>FALCONIFORMES</b> Bonaparte, 1831				
<b>Falconidae</b> Leach, 1820				
<i>Caracara plancus</i> (Miller, 1777)		<a href="https://www.wikiaves.com/1498373">wikiaves.com/1498373</a>	<a href="https://xeno-canto.org/183674">xeno-canto.org/183674</a>	
<i>Milvago chimachima</i> (Vieillot, 1816)				
<i>Milvago chimango</i> (Vieillot, 1816)		<a href="https://www.wikiaves.com/265682">wikiaves.com/265682</a>		
<i>Falco sparverius</i> Linnaeus, 1758				
<b>PSITTACIFORMES</b> Wagler, 1830				
<b>Psittacidae</b> Rafinesque, 1815				
<i>Myiopsitta monachus</i> (Boddaert, 1783)		<a href="https://www.wikiaves.com/1504075">wikiaves.com/1504075</a>	<a href="https://xeno-canto.org/200405">xeno-canto.org/200405</a>	
<b>PASSERIFORMES</b> Linnaeus, 1758				
<b>Thamnophilidae</b> Swainson, 1824				
<i>Thamnophilus ruficapillus</i> Vieillot, 1816		<a href="https://www.wikiaves.com/1503964">wikiaves.com/1503964</a>		
<i>Thamnophilus caerulescens</i> Vieillot, 1816		<a href="https://www.wikiaves.com/1151187">wikiaves.com/1151187</a>		
<b>Furnariidae</b> Gray, 1840				
<i>Cinclodes fuscus</i> (Vieillot, 1818)		<a href="https://www.wikiaves.com/1139327">wikiaves.com/1139327</a>	<a href="https://xeno-canto.org/20602">xeno-canto.org/20602</a>	
<i>Furnarius rufus</i> (Gmelin, 1788)		<a href="https://www.wikiaves.com/1140290">wikiaves.com/1140290</a>		
<i>Limnornis curvirostris</i> Gould, 1839	Pa		<a href="https://macaulaylibrary.org/audio/19235">macaulaylibrary.org/audio/19235</a>	AMNH321841
<i>Phleocryptes melanops</i> (Vieillot, 1817)		<a href="https://www.wikiaves.com/1118376">wikiaves.com/1118376</a>	<a href="https://macaulaylibrary.org/audio/19210">macaulaylibrary.org/audio/19210</a> ; <a href="https://macaulaylibrary.org/audio/19234">macaulaylibrary.org/audio/19234</a>	AMNH321861; AMNH321862; AMNH321863; AMNH321857; AMNH321858; AMNH321859; AMNH321860
<i>Syndactyla rufosuperciliata</i> (Lafresnaye, 1832)				MCN1353
<i>Spartonoica maluroides</i> (d'Orbigny & Lafresnaye, 1837)	NT (Gl); Pa	<a href="https://www.wikiaves.com/1107566">wikiaves.com/1107566</a>	<a href="https://xeno-canto.org/23278">xeno-canto.org/23278</a> ; <a href="https://macaulaylibrary.org/audio/19236">macaulaylibrary.org/audio/19236</a> ; <a href="https://macaulaylibrary.org/audio/19237">macaulaylibrary.org/audio/19237</a> ; <a href="https://macaulaylibrary.org/audio/19238">macaulaylibrary.org/audio/19238</a>	
<i>Phacellodomus striaticollis</i> (d'Orbigny & Lafresnaye, 1838)				AMNH321867

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Table 1. Continued.

	Status	Photo	Voice	Specimen
<i>Anumbius annumbi</i> (Vieillot, 1817)			xeno-canto.org/21641	AMNH321886
<i>Schoeniophylax phryganophilus</i> (Vieillot, 1817)		wikiaves.com/733922	xeno-canto.org/20604; macaulaylibrary.org/audio/19233	
<i>Certhiaxis cinnamomeus</i> (Gmelin, 1788)			xeno-canto.org/21639	
<i>Synallaxis frontalis</i> Pelzelin, 1859		wikiaves.com/733485	xeno-canto.org/20599	
<i>Synallaxis spixi</i> Sclater, 1856			xeno-canto.org/201258	MCN1264; AMNH321865
<i>Limnoides rectirostris</i> (Gould, 1839)	NT (GI)	wikiaves.com/1135218	xeno-canto.org/22560	
<i>Cranioleuca sulphurifera</i> (Burmeister, 1869)	Pa	wikiaves.com/1120851	xeno-canto.org/21153; macaulaylibrary.org/audio/19209	AMNH321876; AMNH321877
<i>Cranioleuca</i> sp.		wikiaves.com/734915; wikiaves.com/1181965		MCN1895, MCN1896, MCN1897
<b>Tityridae</b> Gray, 1840				
<i>Pachyrhamphus polychopterus</i> (Vieillot, 1818)		wikiaves.com/1146752		
<b>Tachuridae</b> Ohlson, Irestedt, Ericson & Fjeldsø, 2013				
<i>Tachuris rubrigastra</i> (Vieillot, 1817)		wikiaves.com/1120874		
<b>Rhynchocyclidae</b> Berlepsch, 1907				
<i>Phylloscartes ventralis</i> (Temminck, 1824)		wikiaves.com/737964	xeno-canto.org/200406	
<i>Poecilotriccus plumbeiceps</i> (Lafresnaye, 1846)				
<b>Tyrannidae</b> Vigors, 1825				
<i>Euscarthmus meloryphus</i> Wied, 1831				
<i>Camptostoma obsoletum</i> (Temminck, 1824)			xeno-canto.org/200393	
<i>Elaenia flavogaster</i> (Thunberg, 1822)				
<i>Elaenia parvirostris</i> Pelzelin, 1868			xeno-canto.org/200401	
<i>Elaenia obscura</i> (d'Orbigny & Lafresnaye, 1837)			xeno-canto.org/200394	
<i>Pseudocolaptes sclateri</i> (Oustalet, 1892)			xeno-canto.org/24003	AMNH321981
<i>Pseudocolaptes flaviventris</i> (d'Orbigny & Lafresnaye, 1837)		wikiaves.com/1118378	xeno-canto.org/201260	AMNH321980
<i>Serpophaga nigricans</i> (Vieillot, 1817)		wikiaves.com/1150788		AMNH 321959; AMNH321960
<i>Serpophaga subcristata</i> (Vieillot, 1817)		wikiaves.com/738705	xeno-canto.org/21642	
<i>Myiarchus swainsoni</i> Cabanis & Heine, 1859			xeno-canto.org/200404	
<i>Pitangus sulphuratus</i> (Linnaeus, 1766)		wikiaves.com/1504080		
<i>Machetornis rixosa</i> (Vieillot, 1819)		wikiaves.com/1142909		
<i>Tyrannus melancholicus</i> Vieillot, 1819		wikiaves.com/1153860		
<i>Tyrannus savana</i> Vieillot, 1808		wikiaves.com/1161337		AMNH321934; AMNH321935
<i>Myiophobus fasciatus</i> (Statius Muller, 1776)		wikiaves.com/1181964	macaulaylibrary.org/audio/19539	
<i>Pyrocephalus rubinus</i> (Boddaert, 1783)		wikiaves.com/1505164		AMNH321924; AMNH321925; AMNH321926
<i>Arundinicola leucocephala</i> (Linnaeus, 1764)		wikiaves.com/1118341		
<i>Lathrotriccus euleri</i> (Cabanis, 1868)		wikiaves.com/1142907		
<i>Lessonia rufa</i> (Gmelin, 1789)		wikiaves.com/1462552		
<i>Knipolegus cyanocephalus</i> (Vieillot, 1818)		wikiaves.com/1299239		AMNH321911
<i>Hymenops perspicillatus</i> (Gmelin, 1789)		wikiaves.com/1504086		MCN1004; AMNH321920; AMNH321921; AMNH321922; AMNH321923
<i>Satrapa icterophrys</i> (Vieillot, 1818)		wikiaves.com/1150787		MCN1009; AMNH321931; AMNH321932; AMNH321933
<i>Xolmis irupero</i> (Vieillot, 1823)		wikiaves.com/1508313		AMNH321905; AMNH321906
<b>Vireonidae</b> Swainson, 1837				
<i>Cyclarhis gujanensis</i> (Gmelin, 1789)		wikiaves.com/736928	xeno-canto.org/20609	AMNH322013
<b>Hirundinidae</b> Rafinesque, 1815				
<i>Pygochelidon cyanocephala</i> (Vieillot, 1817)			xeno-canto.org/20600	
<i>Alopocheilidon fucata</i> (Temminck, 1822)				
<i>Stelgidopteryx ruficollis</i> (Vieillot, 1817)		wikiaves.com/1491779		
<i>Progne tapera</i> (Vieillot, 1817)		wikiaves.com/1149201		
<i>Progne chalybea</i> (Gmelin, 1789)		wikiaves.com/1497928		
<i>Tachycineta leucorrhoa</i> (Vieillot, 1817)		wikiaves.com/1115544		
<i>Tachycineta leucopygia</i> (Meyen, 1834)		wikiaves.com/1151186	xeno-canto.org/21150	
<i>Hirundo rustica</i> Linnaeus, 1758		wikiaves.com/1497823		
<b>Troglodytidae</b> Swainson, 1831				
<i>Troglodytes musculus</i> Naumann, 1823		wikiaves.com/1107567		
<b>Poliophtidae</b> Baird, 1858				
<i>Poliophtila dumicola</i> (Vieillot, 1817)		wikiaves.com/737963	xeno-canto.org/21643	AMNH321993
<b>Turdidae</b> Rafinesque, 1815				
<i>Turdus rufiventris</i> Vieillot, 1818			xeno-canto.org/200397	
<i>Turdus amaurochalinus</i> Cabanis, 1850		wikiaves.com/1496625		
<i>Turdus albicollis</i> Vieillot, 1818			xeno-canto.org/200396	

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Table 1. Continued.

	Status	Photo	Voice	Specimen
<b>Mimidae</b> Bonaparte, 1853				
<i>Mimus saturninus</i> (Lichtenstein, 1823)		wikiaves.com/1142910		
<i>Mimus triurus</i> (Vieillot, 1818)		wikiaves.com/1000886		
<b>Motacillidae</b> Horsfield, 1821				
<i>Anthus lutescens</i> Pucheran, 1855			xeno-canto.org/200391	
<i>Anthus furcatus</i> d'Orbigny & Lafresnaye, 1837			xeno-canto.org/22564	
<i>Anthus correndera</i> Vieillot, 1818		wikiaves.com/1491766	xeno-canto.org/201254; macaulaylibrary.org/audio/20134	
<b>Passerellidae</b> Cabanis & Heine, 1850				
<i>Zonotrichia capensis</i> (Statius Muller, 1776)			xeno-canto.org/200411	
<i>Ammodramus humeralis</i> (Bosc, 1792)			xeno-canto.org/200399	
<b>Parulidae</b> Wetmore, Friedmann, Lincoln, Miller, Peters, van Rossem, Van Tyne & Zimmer 1947				
<i>Setophaga pitiayumi</i> (Vieillot, 1817)			xeno-canto.org/200408	
<i>Geothlypis aequinoctialis</i> (Gmelin, 1789)		wikiaves.com/1140292		
<i>Basileuterus culicivorus</i> (Deppe, 1830)		wikiaves.com/1137435	xeno-canto.org/201255	
<i>Myiothlypis leucoblephara</i> (Vieillot, 1817)	AF		xeno-canto.org/200392	
<b>Icteridae</b> Vigors, 1825				
<i>Icterus pyrrhopterus</i> (Vieillot, 1819)			xeno-canto.org/200402	
<i>Amblyramphus holosericeus</i> (Scopoli, 1786)		wikiaves.com/1299222		AMNH322088
<i>Agelasticus thilius</i> (Molina, 1782)			xeno-canto.org/200398	AMNH322102
<i>Chrysomus ruficapillus</i> (Vieillot, 1819)		wikiaves.com/1121200		
<i>Pseudoleistes virescens</i> (Vieillot, 1819)		wikiaves.com/1149202		AMNH322081; AMNH322082
<i>Agelaioides badius</i> (Vieillot, 1819)		wikiaves.com/1135085		
<i>Molothrus rufoaxillaris</i> Cassin, 1866		wikiaves.com/1497934		
<i>Molothrus bonariensis</i> (Gmelin, 1789)		wikiaves.com/1503970		
<i>Sturnella supercilialis</i> (Bonaparte, 1850)		wikiaves.com/1151185		AMNH322092
<b>Thraupidae</b> Cabanis, 1847				
<i>Coereba flaveola</i> (Linnaeus, 1758)				
<i>Saltator similis</i> d'Orbigny & Lafresnaye, 1837		wikiaves.com/1503501	xeno-canto.org/201257	
<i>Saltator aurantirostris</i> Vieillot, 1817		wikiaves.com/1150785	xeno-canto.org/20611	
<i>Lanio cucullatus</i> (Statius Muller, 1776)			xeno-canto.org/200403	
<i>Tangara sayaca</i> (Linnaeus, 1766)		wikiaves.com/1495884		
<i>Tangara preciosa</i> (Cabanis, 1850)				
<i>Stephanophorus diadematus</i> (Temminck, 1823)		wikiaves.com/1495885		
<i>Paroaria coronata</i> (Miller, 1776)		wikiaves.com/996688		
<i>Pipraeidea bonariensis</i> (Gmelin, 1789)		wikiaves.com/1498404	xeno-canto.org/200407	
<i>Donacospiza albifrons</i> (Vieillot, 1817)		wikiaves.com/1113931	xeno-canto.org/201259	
<i>Poospiza nigrorufa</i> (d'Orbigny & Lafresnaye, 1837)		wikiaves.com/1299226	xeno-canto.org/20608; macaulaylibrary.org/audio/19322	AMNH322049; AMNH322050; AMNH322051
<i>Sicalis flaveola</i> (Linnaeus, 1766)		wikiaves.com/1504081		AMNH322052
<i>Sicalis luteola</i> (Sparman, 1789)		wikiaves.com/1151184		
<i>Embernagra platensis</i> (Gmelin, 1789)		wikiaves.com/1508315		
<i>Volatinia jacarina</i> (Linnaeus, 1766)		wikiaves.com/1161339		
<i>Sporophila collaris</i> (Boddaert, 1783)		wikiaves.com/1107578		MCN1420
<i>Sporophila caerulescens</i> (Vieillot, 1823)			xeno-canto.org/200409; macaulaylibrary.org/audio/20262	
<i>Sporophila ruficollis</i> Cabanis, 1851	VU (RS, Br)	wikiaves.com/451759 wikiaves.com/1616273		
<i>Sporophila palustris</i> (Barrows, 1883)	EN (Gl); VU (RS, Br); Pa	wikiaves.com/455703		
<i>Sporophila cinnamomea</i> (Lafresnaye, 1839)	VU (Gl); Pa	wikiaves.com/455683		
<b>Cardinalidae</b> Ridgway, 1901				
<i>Cyanoloxia glaucoacaerulea</i> (d'Orbigny & Lafresnaye, 1837)			xeno-canto.org/200400	
<i>Cyanoloxia brissonii</i> (Lichtenstein, 1823)		wikiaves.com/1140287	xeno-canto.org/201256	
<b>Fringillidae</b> Leach, 1820				
<i>Sporagra magellanica</i> (Vieillot, 1805)		wikiaves.com/1501963		
<i>Euphonia chlorotica</i> (Linnaeus, 1766)				
<b>Passeridae</b> Rafinesque, 1815				
<i>Passer domesticus</i> (Linnaeus, 1758)		wikiaves.com/1495882		

and *S. cinnamomea*, dealt under the “threatened species” section.

*Sarkidiornis sylvicola*. Four individuals in female plumage were observed standing in a flooded grassy marsh with nearly 500 *Dendrocygna viduata* (Linnaeus, 1766) on 21 June 2008.

*Pardirallus maculatus*. A single individual was observed in a wet roadside with grassy vegetation on 14 September 2008 and in a patch with similar conditions amidst *Eryngium pandanifolium* at the edge of the marsh on 23 October 2014.

*Chroicocephalus cirrocephalus*. A few individuals were observed along the Lagoa Mirim, usually with *Chroicocephalus maculipennis* (Lichtenstein, 1823), on 14 field trips covering all seasons of the year.

*Micrococyx cinereus*. One to two individuals were recorded in small patches of *restinga* forest from 13 December 2008 to late January 2009.

*Euscarthmus meloryphus*. One individual was observed in *restinga* forest on 15–16 November 2008 and 13 December 2008.

*Elaenia flavogaster*. A pair observed in sandy *restinga* forest at the northern limit of the reserve on 17 July 2008 constitutes the only record for our study area.

### Endemic species

We recorded five species endemic to the Pampas biogeographic province: *Limnornis curvirostris* Gould, 1839, *Spartonoica maluroides* (d’Orbigny & Lafresnaye, 1837), *Cranioleuca sulphurifera* (Burmeister, 1869), *Sporophila palustris* (Barrows, 1883) and *S. cinnamomea*. *Veniliornis spilogaster* (Wagler, 1827) and *Myiothlypis leucoblephara* (Vieillot, 1817) were the only Atlantic Forest endemics recorded.

### Species of conservation concern

Nine species are threatened or near-threatened with extinction in state (RS), national (BR) and/or global (GL) levels. Occurrence and abundance of these species is detailed below.

*Rhea americana* (GL – Near-threatened). Small groups of 1–5 individuals were frequently observed in grasslands and fallow rice fields that mark the northern limits of the reserve. This species was not recorded using habitats within the reserve.

*Phoenicopus chilensis* Molina, 1782 (GL – Near-threatened). A lone individual was observed foraging on the shores of the Lagoa Mirim on 24 January 2009.

*Circus cinereus* Vieillot, 1816 (RS, BR – Vulnerable). Lone individuals were frequently observed hunting in low flight over grasslands and wetlands throughout the area, especially during the winter. Although we did not observe evidences of breeding within the reserve, the RBMG constitutes an important foraging ground for this harrier.

*Calidris subruficollis* (Vieillot, 1819) (BR – Vulnerable;

GL – Near-threatened). We observed eight individuals standing on the beach at the Lagoa Mirim on 22 February 2008, and seven birds in an overgrazed grassland on the outskirts of the reserve on 24 October 2008.

*Spartonoica maluroides* (GL – Near-threatened). As much as 25 individuals were recorded per day in tall emergent macrophytes and grasses during the autumn and winter. Rarer during the spring and summer. Presence of young birds and records of territorial adults during this period suggests local breeding.

*Limnornis rectirostris* (Gould, 1839) (GL – Near-threatened). Occurs in *E. pandanifolium* patches that mark the transition between wetlands and higher terrain to the north and also in patches of this plant that occur in seasonally flooded grasslands along the Canal São Gonçalo (Fig. 3 d, e). We estimate that approximately 15 pairs occur within the RBMG.

*Sporophila ruficollis* (RS, BR – Vulnerable; GL – Near-threatened). A male with plumage corresponding to the type morph (grey cap, chocolate throat, pale creamy underparts and brownish upperparts; Areta et al. 2011) accompanied by a female-plumaged individual were observed on a roadside (32°07’25” S, 052°35’28” W) across Santa Isabel in neighboring Rio Grande municipality on 6 and 7 February 2009. Birds were frequently observed feeding together on *Paspalum urvillei* (Poaceae) seeds. Despite intensive surveys for *Sporophila* seedeaters within the limits of the RBMG, we never recorded this species in the reserve.

*Sporophila palustris* (RS, BR – Vulnerable; GL – Endangered). Recorded on all expeditions between December 2008 and March 2009. This species is restricted to seasonally flooded wet grasslands that occur on the eastern border of the marsh along the Canal São Gonçalo (Figure 3d). Approximately seven pairs occur in the reserve. Two nests and adults feeding nestlings and fledglings were observed. Details of these breeding records and of the breeding biology of the species were described in Vizentin-Bugoni et al. (2013).

*Sporophila cinnamomea* (GL – Vulnerable). A lone male was observed on the eastern sector of the reserve on 13 and 19 December 2008. The same individual was presumably detected on both occasions.

### Roosts

Six species roosted in large or moderate numbers in the reserve: *Nycticorax nycticorax* (Linnaeus, 1758), *Ardea alba* Linnaeus, 1758, *Plegadis chihi* (Vieillot, 1817), *Rostrhamus sociabilis* (Vieillot, 1817), *Tachycineta leucorhoa* (Vieillot, 1817) and *Chrysomus ruficapillus* (Vieillot, 1819) (Table 2). Largest numbers corresponded to *P. chihi* (5,000 individuals) and *C. ruficapillus* (4,000 individuals). Roosts were located in stands of tall emergent macrophytes and *sarandi* bushes in the marsh located in the central sector of the RBMG.

**Table 2.** Species, date and number of individuals congregating in roosts within the limits of the Reserva Biológica do Mato Grande, Rio Grande do Sul, Brazil.

Species	Date	Number of individuals
<i>Plegadis chihi</i>	15 March 2008	3,500
	19 April 2008	5,000
	21 June 2008	5,000
	23 August 2008	1,100
	24 October 2008	2,330
	25 March 2009	8,795
<i>Chrysomus ruficapillus</i>	17 May 2008	4,000
<i>Tachycineta leucorrhoa</i>	19 April 2008	600
<i>Ardea alba</i>	10 February 2009	90
<i>Rostrhamus sociabilis</i>	15 March 2008	80
<i>Nycticorax nycticorax</i>	24 October 2008	53

## DISCUSSION

### Species list

The 211 species listed for the RBMG and adjacencies corresponds to almost one-third (31.9%) of the total number of birds included in the primary list of the state of Rio Grande do Sul ( $n = 661$ ; Bencke et al. 2010). Species richness is also high when compared to other wetlands in the state (Table 3). Direct comparisons of the total number of species recorded in these areas are hampered by a series of factors. Differences in species richness may relate to differences in sampling methods, especially temporal coverage, night sampling and use of playback to detect secretive species. There are also differences in the total area sampled and in habitats included in each study. Areas with the highest number of species (e.g., Accordi and Barcellos 2006) are larger and include various types of forest and grassland habitats adjacent to wetlands. Not surprisingly, species responsible for the differences in richness between the above mentioned localities and the RBMG are usually forest and grassland taxa.

Species included in our list but not recorded in the field (*F. armillata* and *A. clamator*) were collected by William Belton in the vicinities of the reserve in 1972 and 1974, respectively. *Asio clamator* is uncommon in the region (Belton 1994), and may have been overlooked during our surveys. *Fulica armillata*, on the other hand, is common in open marshes, reservoirs and lagoons in southern Rio Grande do Sul (Belton 1994), and was frequently recorded in the Lagoa Mirim across the RBMG

in neighboring Rio Grande municipality, sometimes in large numbers (RAD, pers. obs.). This coot is highly vagile and prone to local concentration (Belton 1994), and therefore easily overlooked. Unidentified coots observed at a distance on March 2008 could potentially be this species.

We detected in the field all species collected by Emil Kaempfer in Santa Isabel in the 1930s, which suggests that local extinctions were rare or did not occur in our study area. The only species Kaempfer collected near the reserve (some 15 km to the southeast) and that has been considered locally extinct is *Gubernatrix cristata* (Vieillot, 1817) (Bencke et al. 2003). However, based on information in Bencke et al. (2003), it is unlikely that suitable habitat for this species occurred in the reserve.

Estimates of species richness indicate that sampling effort was sufficient to detect most species present in the RBMG region. According to distributional information in Belton (1994), Mähler-Jr. et al. (1996), Maurício and Dias (1996, 2000), Dias and Maurício (1998) and Bencke et al. (2003), at least 27 additional species occur in our study area and may eventually be recorded in the reserve (Table 4). Considering information on habitat use, seasonal occurrence and abundance of these species in southern Rio Grande do Sul (Belton 1994; Mähler-Jr. et al. 1996; Maurício and Dias 1996, 2000), we believe that *Ixobrychus involucris* (Vieillot, 1823) and *Nycticryphes semicollaris* (Vieillot, 1816) are likely to occur within the reserve and were probably missed during fieldwork due to their inconspicuous behavior. Adequate habitat for *Riparia riparia* (Linnaeus, 1758) also occurs within the reserve. In fact, we may have observed this species on a few occasions during the summer, but since birds were always distant and could not be safely separated from overall similar young *Pygochelidon cyanoleuca* (Vieillot, 1817), we refrained from including the species in our list. Habitat within the reserve is also suitable for *Anas platalea* Vieillot, 1816, *Heteronetta atricapilla* (Merrem, 1841), *Calidris canutus* (Linnaeus, 1758), *Calidris himantopus* (Bonaparte, 1826) and *Phalaropus tricolor* (Vieillot, 1819). We may have failed to detect these species during fieldwork because of their local scarceness and seasonal occurrence in the region (Belton 1994; Maurício and Dias 1996).

We were able to document 88.2% of the species listed for the RBMG and surroundings. All species lacking documentation occur throughout southern Rio Grande do Sul and have been photographed and/or had their voices recorded in nearby areas (see [www.wikiaves.com](http://www.wikiaves.com) and [www.xeno-canto.org](http://www.xeno-canto.org)).

Records for *E. meloryphus* in the RBMG are the first published for the southern coastal plain of Rio Grande do Sul and extend its known distribution approximately 300 km to the west based on the distributional maps available in Belton (1994), Ridgely and Tudor (1994) and

**Table 3.** Number of species recorded in wetlands in Rio Grande do Sul, Brazil.

Species	Locality	Source
211	Reserva Biológica do Mato Grande	This study
220	Estação Ecológica do Taim	Mähler-Jr. et al. (1996)
176	Saco da Mangueira	Dias and Maurício (1998)
210	Banhado dos Pachecos	Accordi and Hartz (2006)
283	Catchment of the Lago Guaíba	Accordi and Barcellos (2006)
171	Lagoa do Casamento	Bencke et al. (2007)
170	Butiazaís de Tapes	Bencke et al. (2007)
230	Parque Nacional da Lagoa do Peixe	Harrison et al. (2013)



**Table 4.** Species mentioned for the region of the Reserva Biológica do Mato Grande, Brazil, in Belton (1994), Mähler-Jr. et al. (1996), Maurício and Dias (1996, 2000) Dias and Maurício (1998) and Bencke et al. (2003), but not detected during field trips.

<b>ANSERIFORMES</b> Linnaeus, 1758	<b>GRUIFORMES</b> Bonaparte, 1854	<b>STRIGIFORMES</b> Wagler, 1830
<b>Anatidae</b> Leach, 1820	<b>Rallidae</b> Rafinesque, 1815	<b>Strigidae</b> Leach, 1820
<i>Anas sibilatrix</i> Poeppig, 1829	<i>Aramides cajaneus</i> (Statius Muller, 1776)	<i>Asio flammeus</i> (Pontoppidan, 1763)
<i>Anas cyanoptera</i> Vieillot, 1816	<i>Laterallus leucopyrrhus</i> (Vieillot, 1819)	<b>PASSERIFORMES</b> Linnaeus, 1758
<i>Anas platalea</i> Vieillot, 1816	<b>CHARADRIIFORMES</b> Huxley, 1867	Scleruridae Swainson, 1827
<i>Heteronetta atricapilla</i> (Merrem, 1841)	<b>Charadriidae</b> Leach, 1820	<i>Geositta cunicularia</i> (Vieillot, 1816)
<i>Oxyura vittata</i> (Philippi, 1860)	<i>Oreopholus ruficollis</i> (Wagler, 1829)	<b>Tyrannidae</b> Vigors, 1825
<b>PELECANIFORMES</b> Sharpe, 1891	<b>Scolopacidae</b> Rafinesque, 1815	<i>Myiodynastes maculatus</i> (Statius Muller, 1776)
<b>Ardeidae</b> Leach, 1820	<i>Limosa haemastica</i> (Linnaeus, 1758)	<i>Xolmis cinereus</i> (Vieillot, 1816)
<i>Ixobrychus involucris</i> (Vieillot, 1823)	<i>Calidris canutus</i> (Linnaeus, 1758)	<b>Vireonidae</b> Swainson, 1837
<b>CATHARTIFORMES</b> Seebohm, 1890	<i>Calidris himantopus</i> (Bonaparte, 1826)	<i>Vireo chivi</i> (Vieillot, 1817)
<b>Cathartidae</b> Lafresnaye, 1839	<i>Phalaropus tricolor</i> (Vieillot, 1819)	<b>Hirundinidae</b> Rafinesque, 1815
<i>Coragyps atratus</i> (Bechstein, 1793)	<b>Rostratulidae</b> Mathews, 1914	<i>Riparia riparia</i> (Linnaeus, 1758)
<b>ACCIPITRIFORMES</b> Bonaparte, 1831	<i>Nycticoraphes semicollaris</i> (Vieillot, 1816)	<b>Motacillidae</b> Horsfield, 1821
<b>Accipitridae</b> Vigors, 1824	<b>CUCULIFORMES</b> Wagler, 1830	<i>Anthus hellmayri</i> Hartert, 1909
<i>Elanus leucurus</i> (Vieillot, 1818)	<b>Cuculidae</b> Leach, 1820	<b>Thraupidae</b> Cabanis, 1847
<i>Geranoaetus albicaudatus</i> (Vieillot, 1816)	<i>Tapera naevia</i> (Linnaeus, 1766)	<i>Pipraeidea melanonota</i> (Vieillot, 1819)
<i>Buteo swainsoni</i> Bonaparte, 1838		

BirdLife International (2014). This species was recorded in the 1970s in western Rio Grande do Sul and in contiguous regions of Uruguay in the departments of Artigas and Salto (Gore and Gepp 1978; Belton 1994). Recent distributional information on the birds of Uruguay (Azpiroz 2001, 2012; Rocha 2008; Olmos 2009) map its presence for all departments along the Rio Uruguay as well as in San José, Florida and Canelones. The species has also been recently recorded in eastern Rio Grande do Sul from the Lago Guaíba catchment area (Accordi and Barcellos 2006) north to Capão da Canoa, and in the southwestern sector of the state along the Uruguayan border (Azpiroz 2012; [www.wikiaves.com](http://www.wikiaves.com)). Taken together, these observations suggest that the species is expanding its range to the south and east in Rio Grande do Sul and Uruguay.

Records of *S. cinnamomea* and *S. ruficollis* are also the first for the coastal plain of Rio Grande do Sul based on distribution maps in Belton (1994), Bencke et al. (2003) and BirdLife International (2014). The nearest population of *S. cinnamomea* occurs in grasslands of the Serra do Sudeste hills, some 40 km to the west of our study area (RAD, pers. obs.), whereas established populations of *S. ruficollis* are found along the Rio Uruguay, nearly 500 km away (Bencke et al. 2003; Azpiroz 2012). In Rio Grande do Sul, both species occur in tall-grass grasslands in regions of gently undulated terrain, and were never recorded in large wetlands (Belton 1994; Bencke et al. 2003). Since our records for both species in the RBMG may relate to vagrant individuals, we recommend that surveys should be carried out in the Canal São Gonçalo region to solve the status of occurrence of these birds in coastal Rio Grande do Sul.

The remaining species listed as distributional novelties have been recently recorded throughout southern Rio Grande do Sul ([www.wikiaves.com](http://www.wikiaves.com); [www.xeno-canto.org](http://www.xeno-canto.org)).

With the exception of *S. sylvicola* and *M. cinereus*, all are widespread and some appear to be common as inferred from data in the WikiAves and Xenocanto websites. Additional studies are necessary to determine if these records can be attributed to range extension or range expansion in the state (*sensu* Frey 2009; see also a discussion in Dias et al. 2010).

## Roosts

Tall stands of dense emergent aquatic vegetation are important roosting places for some congregational birds. The highest numbers of birds roosting in the reserve were recorded from March to October, which corresponds to the non-breeding season of the local avifauna (Maurício et al. 2013), and when the water level in wetlands is higher. Despite the fact that large numbers of birds roost within the reserve, we found no evidences of colonial breeding of waterbirds in the area.

In a regional context, the RBMG is one of many other roosting areas existent in the Canal São Gonçalo floodplains (Bencke et al. 2006). Although we recorded high numbers of *P. chihi* roosting in the reserve, we counted nearly 14,000 birds flying over our study area and heading for dormitories located to the east, in Rio Grande municipality across the village of Santa Isabel on 19 April 2008. Identification and conservation of other roosting sites in the region is also necessary.

## Conservation

The large number of species associated with aquatic environments recorded in the RBMG, especially those belonging to the Anatidae, Ardeidae, Threskiornithidae and Rallidae families, suggests that this protected area is important for the conservation of waterbirds in a regional context. However, to fully understand the importance of the RBMG for waterbird conservation,

additional studies focusing on populational aspects of waterbirds using the reserve and other wetlands in southern Brazil are needed.

Of the nine conservation-concern species recorded in our study area, only four use the RBMG on a regular basis and/or have populations established within the reserve. The RBMG is especially important for the conservation of the endemic *S. palustris*, which breeds in the reserve (Vizentin-Bugoni et al. 2013). The RBMG is also important for the conservation of *C. cinereus*, which occurs regularly, albeit in small numbers, and the endemic *S. maluiroides*, which apparently breeds in the reserve and can be common during the winter. Although the population of *L. rectirostris* within the reserve is not large, most *E. pandanifolium* marshes in the coastal plain have been converted into rice plantations and remaining patches are highly degraded (Bencke et al. 2003). Therefore, the RBMG may be important for this species at least in a local context. Since one of the main threats to these species is habitat modification resulting from excessive use of fire, overgrazing and trampling in tall-herbaceous habitats (Bencke et al. 2003; Vizentin-Bugoni et al. 2013), it is likely that the full implementation of the reserve and removal of cattle would benefit these birds. Control in access by fisherman, hunters and trappers would also be beneficial, especially for *S. palustris*, which is occasionally captured (Vizentin-Bugoni et al. 2013). We emphasize, however, that the complete exclusion of fire and grazing disturbance in grassy environments in protected areas may lead to habitat change and loss of grass-dependent species (Pillar and Vélez 2010). Studies assessing impacts of cattle removal and fire suppression upon grassy habitats and grassland-dependent species in the reserve are therefore required.

Although individuals of the near-threatened *R. americana* were not observed within the limits of the RBMG, this species was frequent in grasslands and fallow rice fields adjacent to the reserve. A slight expansion of the current limits of the RBMG to the north would protect comparatively drier grassland habitats used by this species and ensure that more areas of the reserve would remain free from the effects of floods. The most feasible areas for expansion under this scenario are sandy grasslands unsuitable for agriculture that occur on the northeastern border of the reserve. Development and implementation of sustainable cattle ranching and rice growing practices in the buffer zone surrounding the RBMG would further benefit *R. americana*. Rice fields in the region also hold large concentrations of shorebirds (Dias et al. 2014), and the development of sustainable farming may help raise the conservation value of private areas around the reserve.

The remaining species of conservation importance recorded in the RBMG were rare and usually represented by few individuals. Considering the known distribution

and preferred habitats of these species in the state (Bencke et al. 2003), we can infer that their occurrence in the reserve is occasional and may be even related to vagrancy.

In short, we have demonstrated that the RBMG hosts a large number of bird species and that the reserve is an important area for wetland and grassland dependent species, some of which are endemic and threatened with extinction. Our findings not only emphasize the need to properly manage and conserve this protected area, but also support the indication of the region as an Important Bird Area (Bencke et al. 2006), and as an “area of extreme importance for the conservation, sustainable use and benefit sharing of the Brazilian biodiversity” (MMA 2007). Adequate conservation of birds and their habitats can only be met if the RBMG is fully implemented and effectively managed and protected. We hope that this study serves as an initial step to guide the implementation of the reserve.

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